UNITED STATES MARINE CORPS
Utilities Instruction Company
Marine Cops Engineer School
PSC Box 20069
Camp Lejeune, North Carolina 28542-0069

U-22B01
OCT
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STUDENT HANDOUT

REPAIR SHOWER FACILITY, BARE BASE

1. **LEARNING OBJECTIVES**:

a. **Terminal learning objectives:**

(1) Provided a worksheet for quarterly preventive maintenance and technical inspection for engineer equipment (NAVMC 10560), an item of hygiene equipment, a water source, power source, and fuel, with the aid of references, perform hygiene equipment inspection in accordance with the appropriate technical manual. (1171.05.9)

(2) Provided a malfunctioning Shower Facility, Bare Base, an Equipment Repair Order (NAVMC 10245), a water source, power source, and fuel, with the aid of references, diagnose the malfunction in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.2)

(3) Provided a malfunctioning Shower Facility, Bare Base, and Equipment Repair Order (NAVMC 10245), tools, repair parts, and repair facility, with the aid of references, repair the Shower Facility in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.10)

b. **Enabling learning objectives:**

(1) Provided a Shower Facility, Bare Base, and a Worksheet for Quarterly Preventive Maintenance and Technical Inspection for Engineer Equipment (NAVMC 10560), inspect the unit in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.9e)

(2) Provided a Shower Facility, Bare Base with a malfunctioning temperature regulator valve, a water source, power source, fuel, and references, diagnose the malfunction in accordance with TM 08444A-15/1 and TM 10006A-14&p/1. (1171.05.02a)

(3) Provided a Shower Facility, Bare Base with a malfunctioning temperature regulator valve, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and a repair facility, with the

aid of references, repair the temperature regulator valve in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.10a)

(4) Provided a Shower Facility, Bare Base with a malfunctioning water heater fuel pump, a water source, power source, fuel, and references, diagnose the malfunction in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.2b)

(5) Provided a Shower Facility, Bare Base with a malfunctioning water heater fuel pump, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and a repair facility, with the aid of references, repair the water heater fuel pump in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.5.10b)

(6) Provided a Shower Facility, Bare Base with a malfunctioning fuel burner system, a water source, power source, fuel, and references, diagnose the malfunction in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.5.02c)

(7) Provided a Shower Facility, Bare Base with a malfunctioning fuel burner system, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and a repair facility, with the aid of references, repair the fuel burner system in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.10c)

(8) Provided a Shower Facility, Bare Base with a malfunctioning drain pump, a water source, power source, fuel, and references, diagnose malfunction in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.2d)

(9) Provided a Shower Facility, Bare Base with a malfunctioning drain pump, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and a repair facility, with the aid of references, repair the drain pump in accordance with TM 08444A-15/1 and TM 10006A-14&P/1. (1171.05.10d)

BODY

1. **INSPECTING THE SHOWER FACILITY BARE BASE**: The preventive maintenance inspections are minimum requirements to keep the showers in an operational status. The use of inspection schedules and their contents do not limit the scope of the inspection. Any defects found during an inspection will be corrected prior to shower use. The inspections are performed by the operator and/or maintenance team. The daily procedures are normally accomplished by operators. The following items will be inspected:

a. Base Assembly

(1) Check base skids for cracks, dents, or loose hardware.

(2) Check drain valve for debris, blockage, loose nuts and bolts.

(3) Check support post for cracks.

b. Framework/Manifold Assembly Check shower head for correct operation. Inspect tubing for damage.

c. Frame Covers

(1) Inspect shower facility fabric covers for damage or dirt buildup.

(2) Inspect velcro fasteners on fabric cover and door assemblies for adequate grip strength.

d. Electrical Harness Inspect all electrical harnesses for damage.

e. Hoses

(1) Suction - Inspect hoses for gaskets, cracks, leaks, or damage.

(2) Drain - Inspect for dirt, debris, cracks, gaskets, leaks, or damage.

(3) Supply - Inspect for dirt, debris, cracks, gaskets, leaks, or damage.

(4) Fuel

(a) Inspect connections for stripping, dents, cracks, leaks, or damage.

(b) Inspect hose line for leaks, cracks, dry rot or damage.

f. Pump Assembly

(1) Inspect piping for cracks, corrosion, and leaks.

(2) Inspect pump housing for cracks, corrosion, and leaks.

(3) Check pump mounting to base skid for loose or missing screws.

(4) Insure that the pump shaft on the drain pump has been lubricated with two squirts of GAA grease.

(5) Inspect all gauges for cracked glass, bent or broken needle.

(6) Ensure outlets have power when circuits are energized.

(7) Ensure temperature regulator valve allows water temperature to increase or decrease when turned.

(8) Check control switch for damage or loose mounting.

(9) Inspect pump cover for damage or debris.

(10) Drain Pump

(a) Ensure that the oil level reaches the fill plug opening.

(b) One pint of 80/90 wt. oil is used in the drain pump.

(c) Check rubber diaphragm for cracks.

g. Water Heater

(1) Check electrodes for sparks.

(2) Check fuel pump and filter for serviceability.

(3) Inspect tank for cracks and leaks.

(4) Check carrying handle for missing or loose nuts and bolts.

(5) Check exhaust duct and blower for security and damage.

(6) Inspect sight tube and glass for any damage.

(7) Check gauges for broken glass, loose fitting, or incorrect readings.

(8) Check all switches for frayed wires.

(9) Check all valves for leaks, cracks, or missing parts.

(10) Check motor for obstruction to vents.

2. **DIAGNOSE AND REPAIR MALFUNCTIONING TEMPERATURE REGULATOR VALVE:**

a. The Water temperature regulator valve is malfunctioning if the water temperature cannot be adjusted by turning the knob.

b. Replace Temperature Regulator.

(1) Disassemble

(a) Disconnect all power supplies to the water pump.

(b) Disconnect M-80 hot water supply hose from the temperature regulator assembly inlet.

(c) Disconnect the supply hose from the temperature regulator outlet.

(d) Unscrew hot water outlet assembly from temperature regulator at pipe nipple

(e) Unscrew cold water inlet assembly from temperature regulator at pipe nipple.

(f) Remove nuts, lock washers, and washers securing U-bolts to the pump frame.

(g) Remove regulator assembly from pump frame.

(2) Replacement Replace all defective items with like, serviceable items.

(3) Assemble

(a) Secure temperature regulator to frame with U-bolts.

(b) Replace the nuts, lock washers, and tighten.

(c) Connect hot water outlet assembly from temperature regulator at pipe nipple.

(d) Connect cold water outlet assembly from temperature regulator at pipe nipple.

(e) Connect the supply hose to the temperature regulator outlet.

(f) Connect M-80 hot water supply hose to the temperature regulator assembly inlet.

(g) Connect all power supplies to the water pump.

3. **DIAGNOSE AND REPAIR A MALFUNCTIONING M80 WATER HEATER FUEL PUMP:**

a. The Fuel pump is malfunctioning if no fuel pressure is being maintained, once the fuel lines have been primed.

(1) Disassemble **(Figure 5-15)**

(a) Remove power connector from control box as a safety precaution against accidental start up.

(b) Disconnect the fuel supply hose assembly **(6)** from the fuel filter inlet elbow.

(c) Elevate the fuel supply hose assembly above the level of the fuel container to allow the fuel to drain back into the container.

(d) Screw the fuel supply hose onto one end of the fuel line holder on the water heater skid.

(e) Disconnect fuel return hose assembly **(11)** from the fuel pump. Drain and secure return hose as described in (c) and (d) above.

(f) Disconnect fitting on fuel line tubing **(13)** at fuel pump elbow **(12)** and separate tubing from elbow.

(g) Remove hex nuts, lock washers, and cap screws that hold the fuel filter bracket **(7)** to the filter mounting bracket**(8)**.

(h) Remove hex nuts, lock washers, that secure the fuel filter bracket **(7)** to fuel filter **(10).** Remove bracket.

(i) Remove hex nuts, lock washers, cap screws, and flat washers that hold filter mounting bracket **(8)** to skid. Remove bracket.

(j) Remove two hex head screws and lock screws and lock washers that hold fuel pump **(2)** to fuel pump bracket.

(k) Remove fuel pump with fuel filter attached from fuel bracket.

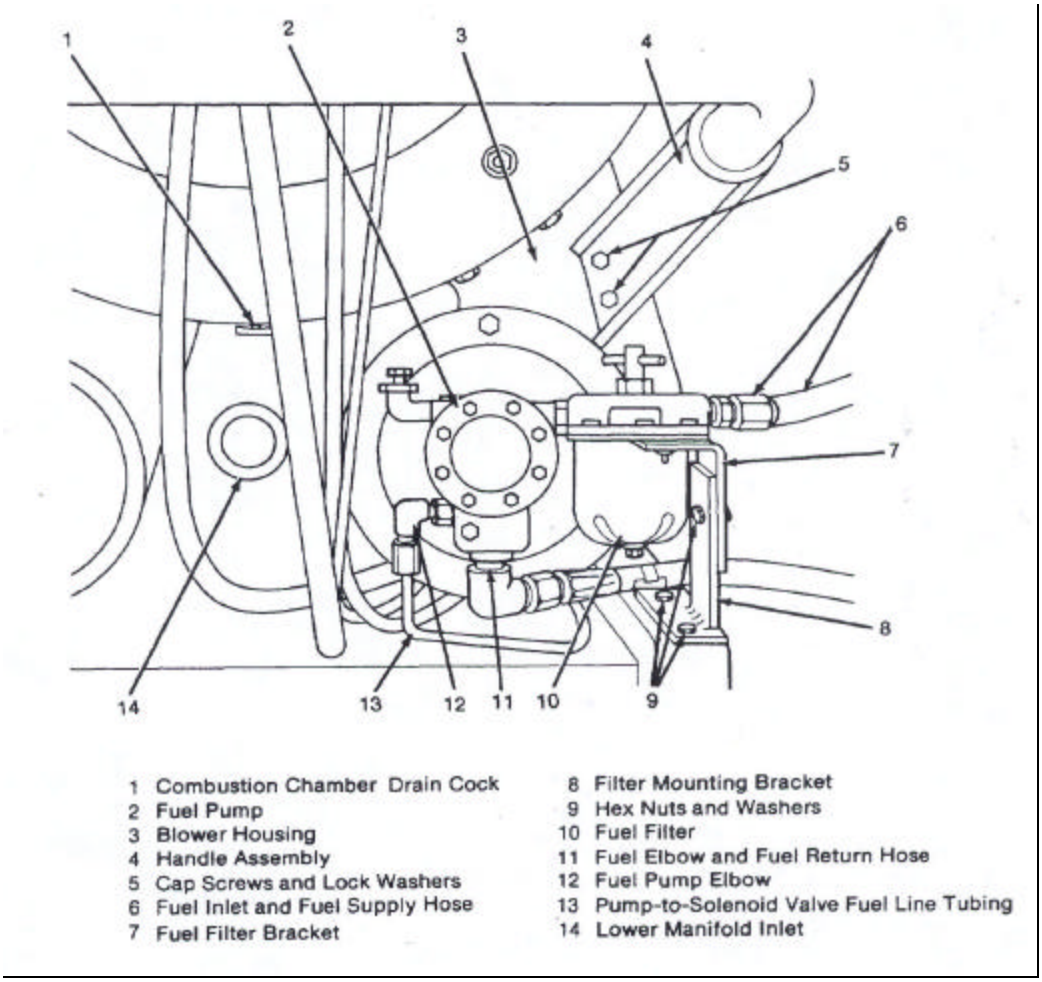


Figure 5-15

(l) Unscrew and remove fuel filter **(20, Figure 5-17)**from reducer nipple.

(m) Loosen two set screws in motor shaft coupling **(7, figure 5-17)** and slip coupling from fuel pump shaft.

(n) Unscrew and remove fuel filter reducer nipple **(21, figure 5-17)** from fuel pump **(23)**.

(o) Remove two elbows **(1,19, Figure 5-17)** and straight elbow **(2)** from pump **(23)**.

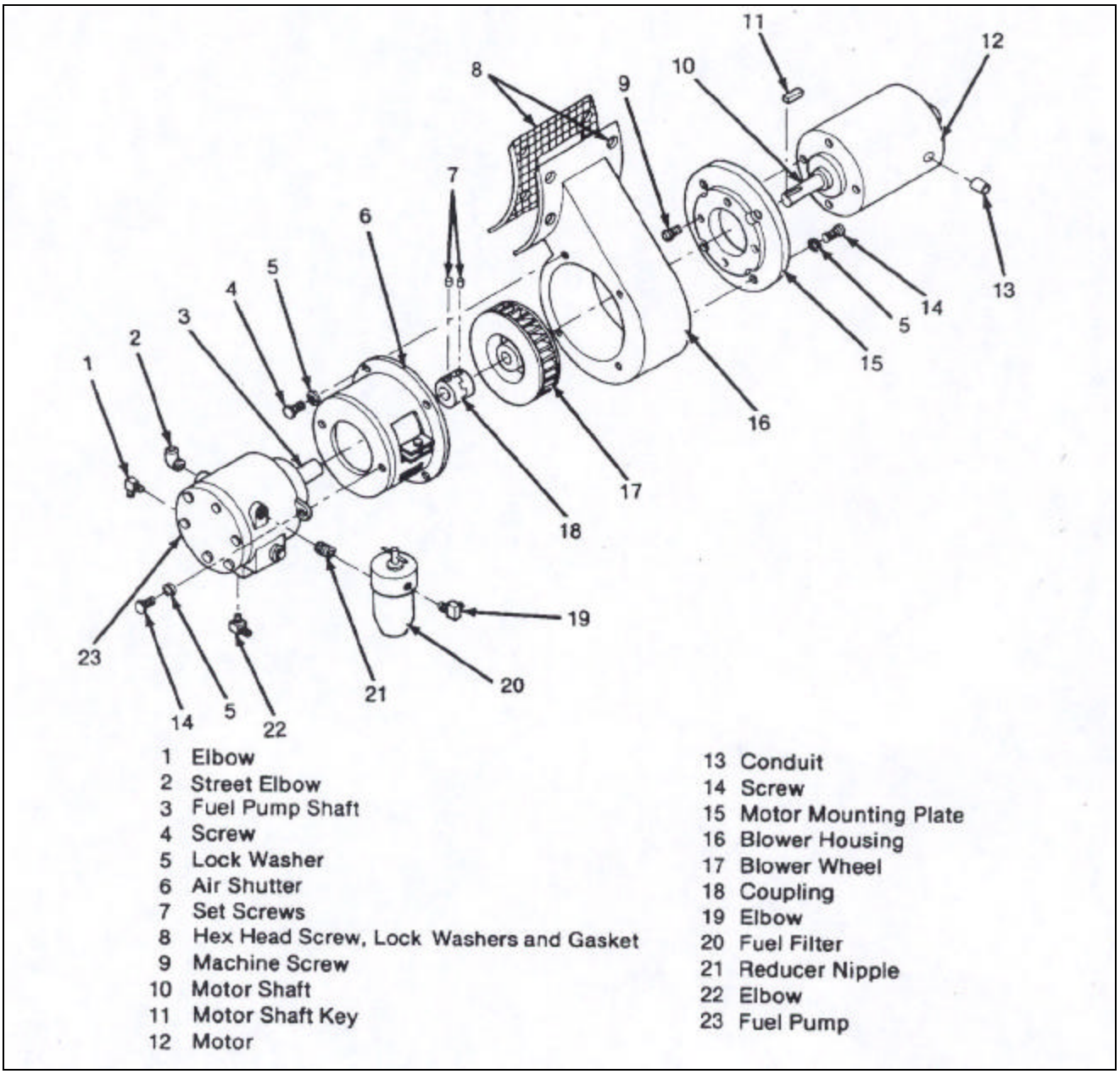


Figure 5-17

(2) Replacement (Replace defective fuel pump and fuel filter with serviceable ones.)

(3) Fuel pump, strainer removal **(Figure 4-7)**

(a) Loosen eight cover screws **(3)** that secure cover **(2)** to fuel pump.

(b) Remove cover **(2)** and screws **(3)** from pump.

(c) Remove gasket cover **(4)** and screws **(3)** from pump.

(d) Grasp strainer **(1)** by handle and slowly slide it from pump.

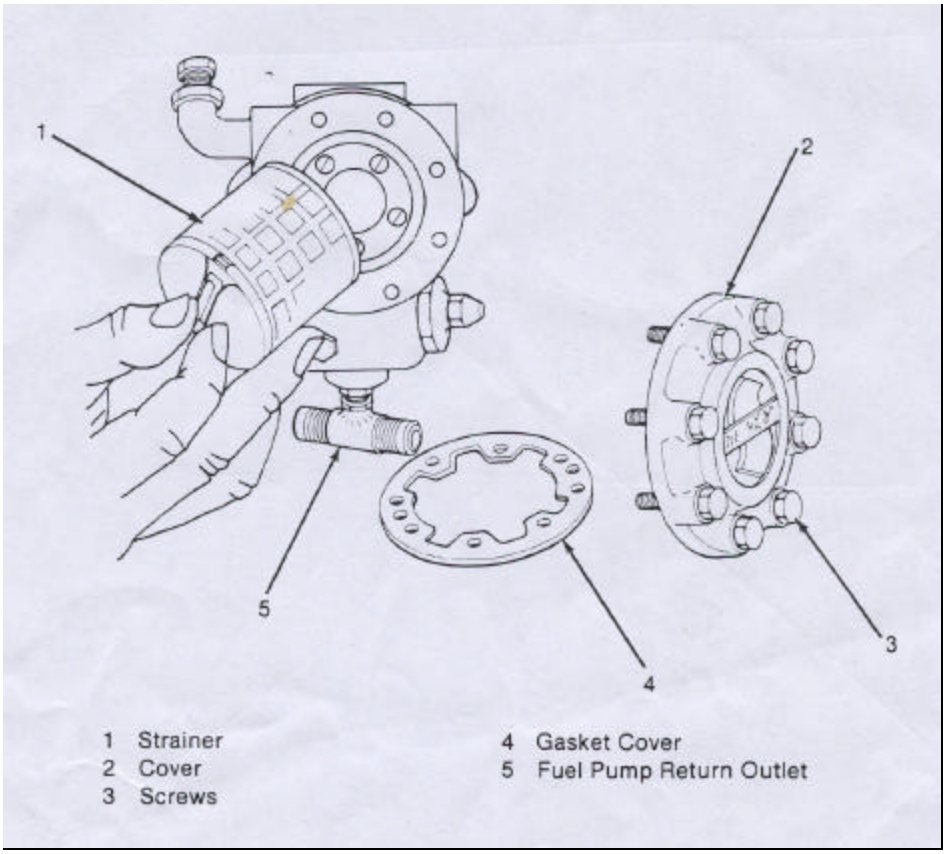


Figure 4-7

(4) Cleaning and Inspection

(a) Cleaning. Wash strainer in approved solvent and allow it to drain and air dry thoroughly.

(b) Inspection. Inspect strainer for damaged or torn screening, and for broken handle.

(5) Replacement Replace all defective items with serviceable items.

(a) Grasp strainer **(1)** by handle and slowly insert it into fuel pump until it seats.

(b) Position new gasket cover **(4)** on fuel pump.

(c) Place pump cover **(2)** over gasket and hold in place with the eight screws **(3)**.

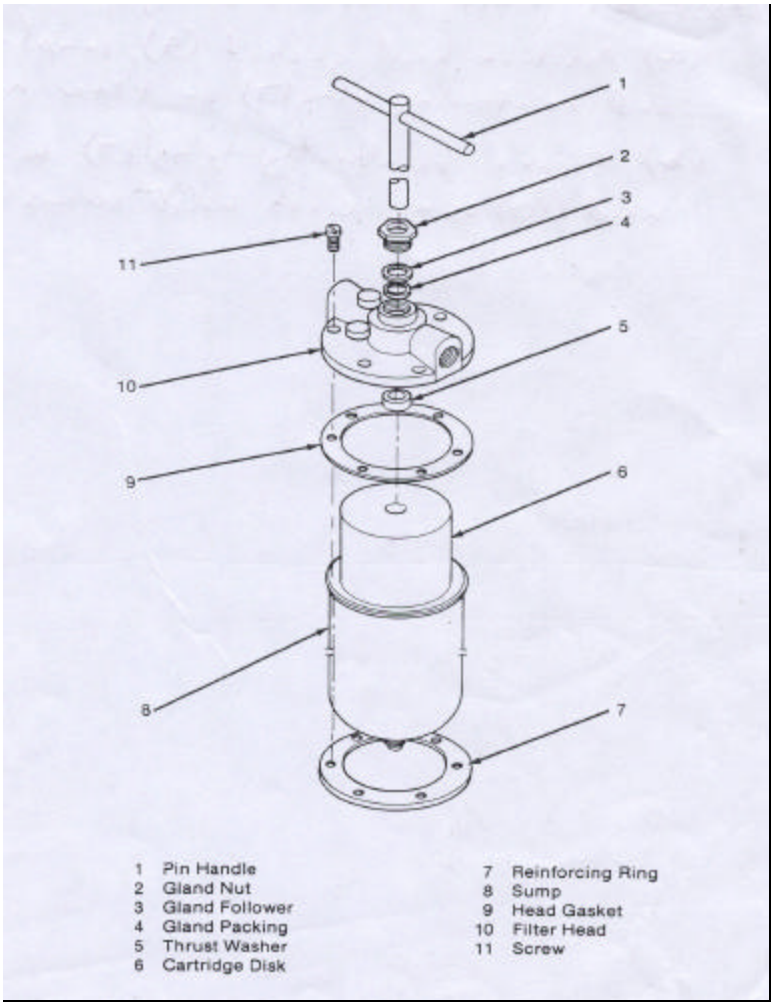
(d) Secure cover and gasket to pump by tightening eight cover screws **(3)**.

b. Fuel filter cartridge, removal **(Figure 5-19)**

(1) Removal

(a) Remove screws **(11)** that hold reinforcing ring **(7)** to filter head **(10)**.

(b) Remove reinforcing ring **(7)**, sump **(8)**, and head



gasket **(9)** from filter head **(10)**.

Figure 5-19

(2) Cleaning and Inspection

(a) Cleaning. Clean all parts with an approved solvent and dry them thoroughly.

(b) Inspection. Inspect filter cartridge assembly for damaged discs or spacers. Inspect reinforcing ring, head, and bracket for damaged threads.

(3) Replacement: Replace all defective items with serviceable items.

(a) Position head gasket **(9)**, sump **(8)**, and reinforcing ring **(7)** on filter head **(10)**.

(b) Secure reinforcing ring **(7)** to filter head **(10)** using cross head screws **(11)**.

(4) Assemble fuel pump and fuel filter

(a) Install two elbows **(1 and 19)** and street elbow **(2)** on fuel pump **(23)**.

(b) Install reducer nipple **(21)** on fuel pump **(23)**.

(c) Screw fuel filter **(20)** onto reducer nipple **(21)**.

(d) Slip motor shaft coupling **(18)** onto fuel pump shaft and tighten the two coupling set screws **(7)**.

(e) Insert fuel pump **(23)** with fuel filter **(20)** attached into fuel pump bracket **(figure 5-15)** until pump seats and dovetail coupling engages.

(f) Secure fuel pump to fuel pump bracket with the two hex screws and lock washers.

(g) Attach filter mounting bracket **(8, figure 5-15)** to water heater skid, using flat washers, cap screws, lock washers, and hex nuts.

(h) Attach fuel filter bracket **(7, figure 5-15)** to fuel filter **(10)** with hex screws, lock washers, and hex nuts.

(i) Attach fuel filter bracket **(7)** to filter mounting bracket **(8)** with cap screws, lock washers, and hex nuts.

(j) Connect fuel line tubing **(13, figure 5-15)** at fuel pump elbow **(12)**. Make certain fitting is tight.

(k) Unscrew fuel return hose assembly from fuel line holder on water heater skid and connect to fuel pump.

(l) Unscrew fuel supply hose assembly from fuel line holder and connect to inlet of the fuel filter.

c. Fuel pressure is too low/high on the fuel pressure gauge.

NOTE: Fuel pump must be in operation to adjust.

(1) Adjustment **(Figure 3-11)**

(a) Remove end cap nut **(1)** and end cap nut gasket from side of fuel pump.

(b) Turn fuel pressure adjust screw **(1)** clockwise to increase fuel pump pressure, and counterclockwise to decrease fuel pressure. Adjust until fuel pressure gauge reads 100 psi.

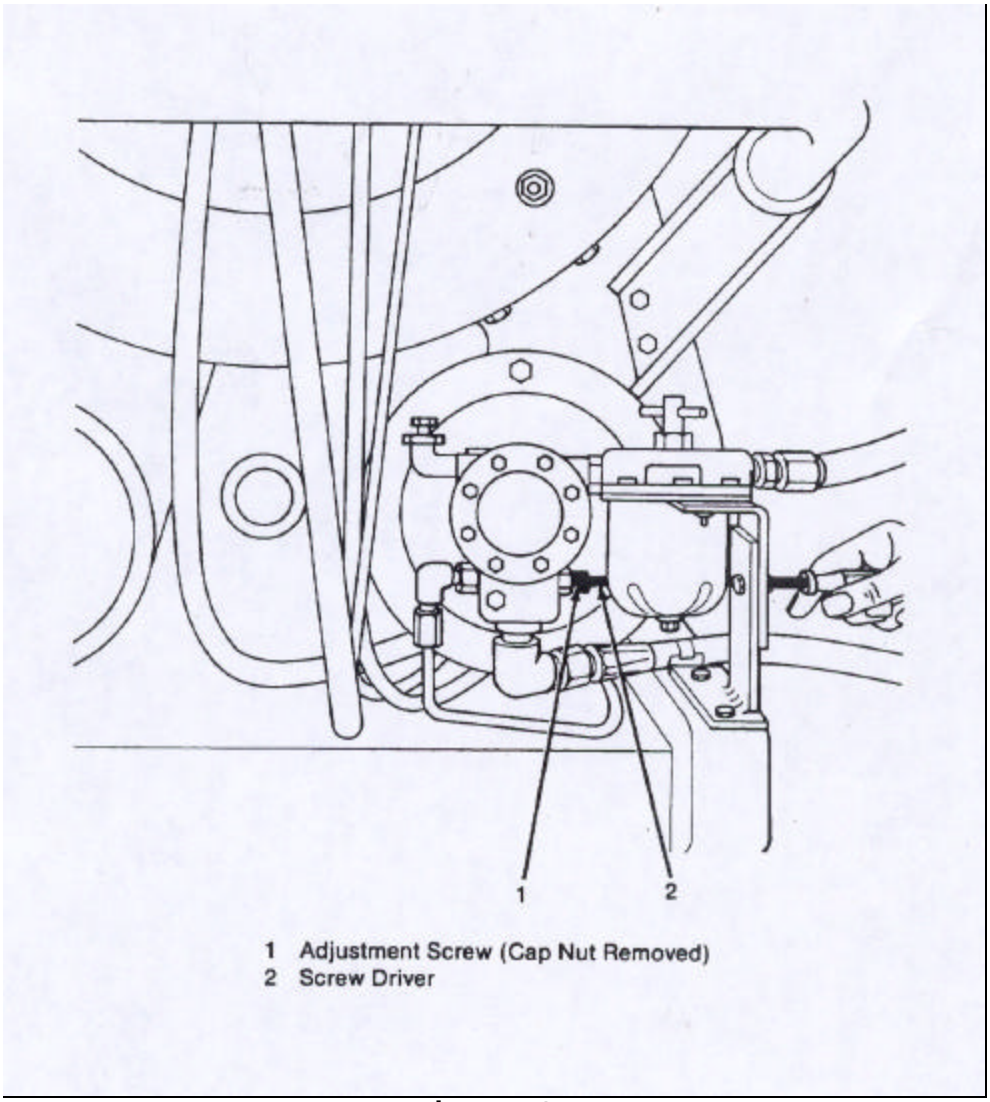


Figure 3-11

(c) Replace end cap gasket and end cap nut on fuel pump.

4. **DIAGNOSE AND REPAIR A MALFUNCTIONING WATER HEATER FUEL BURNER SYSTEM:**

a. Diagnose the Fuel Burner System if the electrodes does not spark or the flame fails to stay lit.

b. Check burner head assembly. **(Figure 5-10)**

(1) To remove, disconnect burner fuel line tube **(14)**, both burner ignition cables **(15)**, and scanner tube **(13)** from burner head assembly.

(2) Remove four hex nuts **(9)** and lock washers **(8)** that secure burner head assembly to water heater.

(3) Remove burner head assembly and burner head gasket **(5)** from water heater.

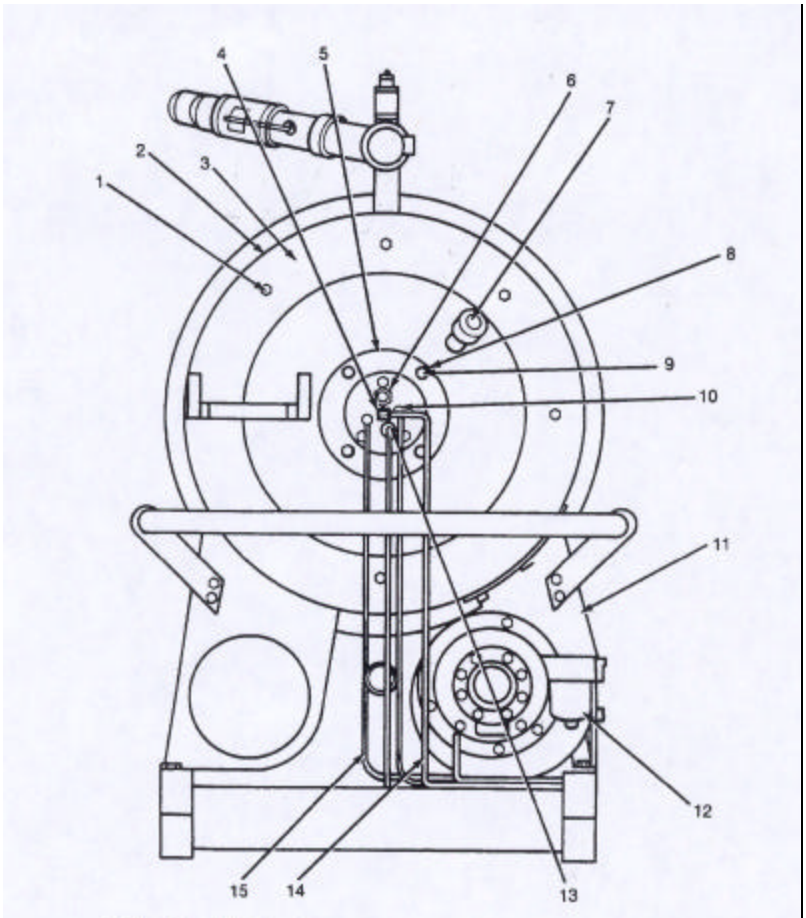


Figure 5-10

(4) Disassembly **(Figure 5-11)**

(a) Remove three nuts and lock washers **(4)** that hold nozzle and electrode assembly **(6)** to burner tube.

(b) Remove nozzle and electrodes assembly **(6)** from burner tube**(3)**.

(c) Remove screws **(1)** that hold air hose **(2)** to burner tube, and separate air hose from burner tube.

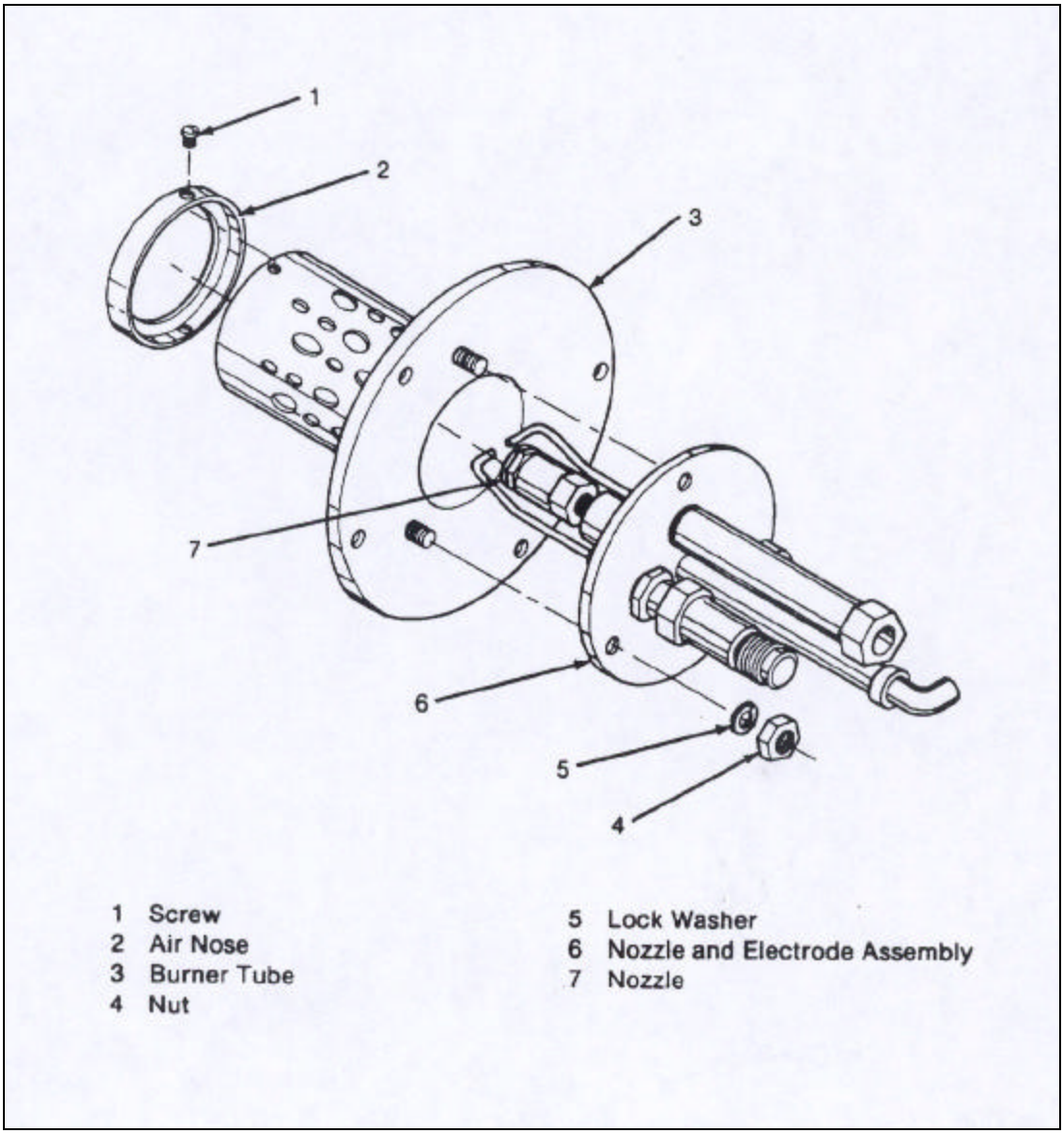


Figure 5-11

(5) Inspection and Cleaning

(a) Inspect for dirty, broken, cracked, and bent burner tube and air nose. Check for carbon deposits, on burner tube and air nose. Inspect for deteriorated gaskets.

(b) Clean all carbon and dirt from burner tube and air nose.

(6) Replacement - Replace all defective items with serviceable items.

(7) Assembly **(Figure 5-11 and 5-10)**

(a) Insert nozzle and electrode assembly **(6)** into burner tube.

(b) Secure nozzle and electrode assembly **(6)** to burner tube **(3)**, using the three lock washers **(5)** and nuts **(4)**.

(c) Connect burner fuel line tubing **(14)**, both ignition cables **(15)**, and scanner tube **(13)** to burner head assembly **(see Figure 5-12)**.

c. Check nozzle and electrode assembly.

(1) Removal **(Figure 5-12)**

(2) Disassembly

(a) Bend both spark plug electrodes **(18)** so they do not strike nozzle **(1)** when spark plugs are removed. **(See Figure 5-11)** for assembled equipment).

(b) Unscrew and remove spark plugs **(3 and 14)** with gaskets **(2)** from nozzle and electrode holder **(16)**.

(c) Separate gaskets **(2)** from spark plugs.

(d) Unscrew and remove nozzle **(1)** with nozzle adapter **(17)** attached to nipple.

(e) Unscrew and remove nozzle **(1)** from nozzle adapter **(17)**.

(f) Mark position of nipple **(9)** with holder **(16)** before removing to ensure proper position during installation.

(g) Loosen the two set screws **(15)** that secure nipple **(9)** to holder **(16)**, and remove nipple from holder.

(h) Remove elbow **(8)** from nipple.

(i) Unscrew and remove ignition sight tube **(4)** from holder **(16)**.

(j) Unscrew and remove peep sight cap **(6)** from ignition sight tube **(4)**.

(k) Remove peep sight glass **(5)** and two peep sight gaskets **(7)**. Separate gaskets from glass.

(l) Loosen the other two set screws **(15)** that secure scanner tube **(13)** to holder **(16)** and slip tube from holder.

(m) Unscrew and remove bushing **(12)** from scanner tube. The coupling **(11)** and close nipple **(10)** will be attached to bushing.

(n) Unscrew and remove close nipple **(10)** from coupling **(11)**.

(o) Unscrew and remove coupling **(11)** from bushing **(12)**.

(3) Inspection and Cleaning

(a) Inspect spark plugs, gaskets, and holder for broken, cracked, and distorted holder, and for damaged threads. Inspect the spark plug electrodes for burned spots, and inspect the insulator for cracks, breaks, and lines (etchings). Check for broken or distorted gaskets.

(b) Inspect nozzle, adapter, nipple and elbow for clogged, cracked, and excessively worn nozzle. Inspect the nozzle for carbon deposits, and the adapter for damaged threads.

(c) Inspect ignition sight tube, cap, and glass. Inspect for broken, or cracked sight glass, stripped or damaged threads on the cap, and leaking gaskets. Check sight tube for damaged threads.

(d) Inspect scanner tube, bushing, coupling and close nipple for damaged threads. Inspect for clogged or obstructed tube.

(e) Wash spark plug electrodes with soapy water and dry them thoroughly.

(f) Wash nozzle and adapter in an approved solvent. Scrub nozzle with a small brush. Dry all parts thoroughly.

(g) Wash sight glass in soapy water and dry it thoroughly.

(h) Wash scanner tube in an approved solvent to remove deposits in tube and dry thoroughly.

(4) Assembly

(a) Screw bushing **(12, figure 5-12)** into coupling **(11)**

(b) Screw close nipple **(10)** into other end of coupling **(11)**.

(c) Screw bushing, with coupling and close nipple attached, onto scanner tube **(13)**.

(d) Slide scanner tube into nozzle and electrode holder **(16)** until tube seats. Secure tube by tightening the two set screws **(15)**.

(e) Place a peep sight gasket **(7)** on each side of peep sight glass **(5)** and position glass and gaskets in ignition sight tube **(4)**.

(f) Secure peep sight glass and gaskets by screwing peep sight cap **(6)** onto ignition sight tube **(4)**.

CAUTION: DO NOT OVERTIGHTEN THE PEEP SIGHT CAP. OVERTIGHTENING CAN CRACK THE SIGHT GLASS.

(g) Screw ignition sight tube **(4)** into holder **(16)**.

(h) Screw elbow **(8)** onto nipple **(9)**.

(i) Slide nipple **(9)** into holder **(16)** and align position marks made during disassembly.

(j) Screw nozzle **(1)** onto nozzle adapter **(17)**.

(k) Screw nozzle adapter **(17)** onto nipple **(9)**.

CAUTION: SPARK PLUGS ARE DESIGNATED AS LEFT-HAND AND RIGHT-HAND PLUGS. BE SURE TO INSTALL SPARK PLUGS IN CORRECT POSITIONS. ELECTRODES CANNOT BE ADJUSTED PROPERLY IF SPARK PLUGS ARE REVERSED. MAKE CERTAIN THAT ELECTRODES DO NOT STRIKE THE NOZZLE.

(l) Slip one spark plug gasket **(2)** onto each spark plug **(3 and 14)**, and screw spark plugs into holder **(16)**.

NOTE: SPARK PLUGS MUST BE INSTALLED IN HOLDER BEFORE MAKING ELECTRODE ADJUSTMENT.

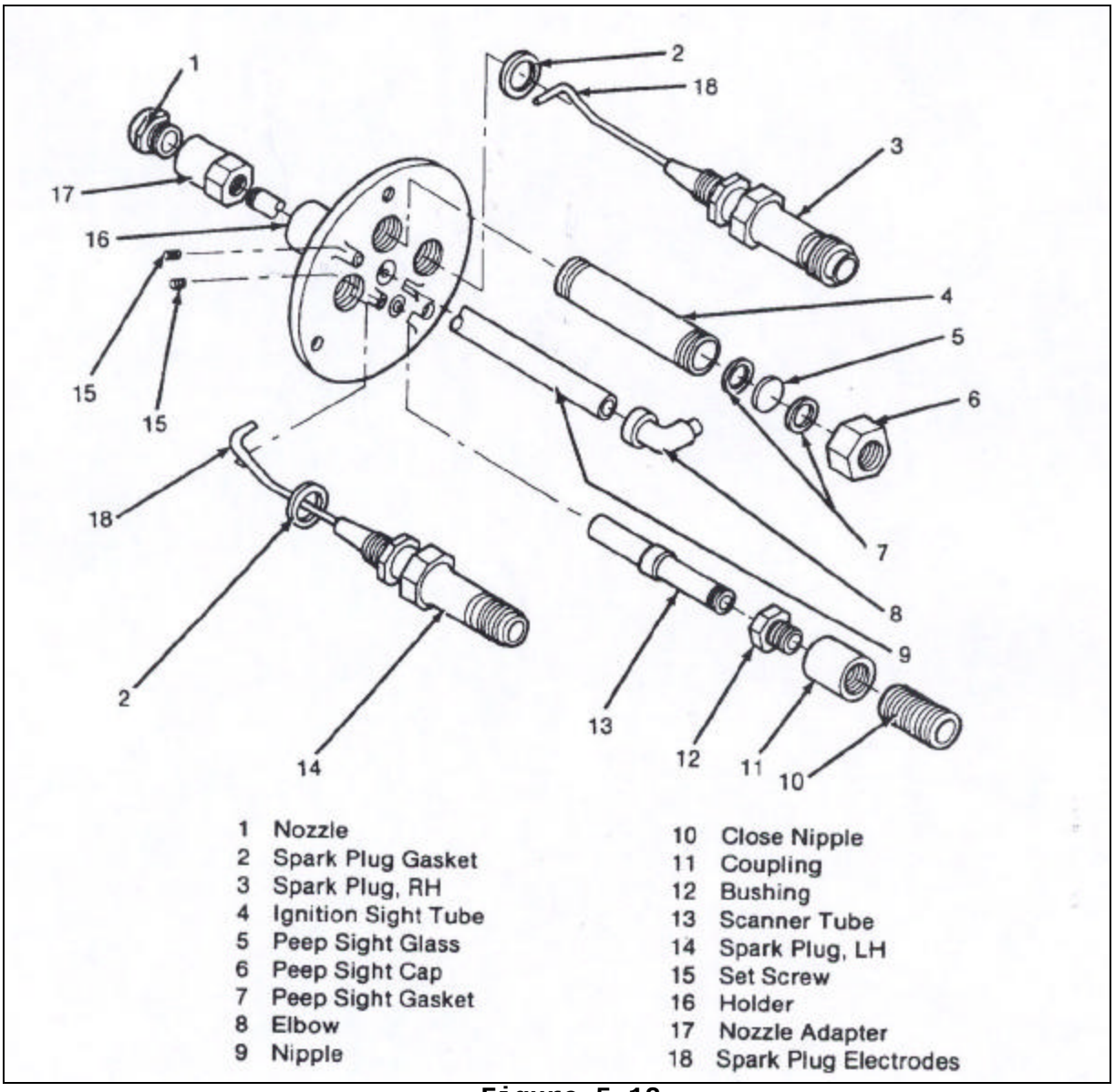


Figure 5-12

(5) Adjustments **(Refer to Figure 5-13)**

(a) Bend spark plug electrodes until spark gap is five thirty seconds of an inch (5/32"), and electrodes are located one-eighth of an inch (1/8") outward and one-half of an inch (1/2") upward from hole on burner nozzle as shown. **(Figure 5-13)**

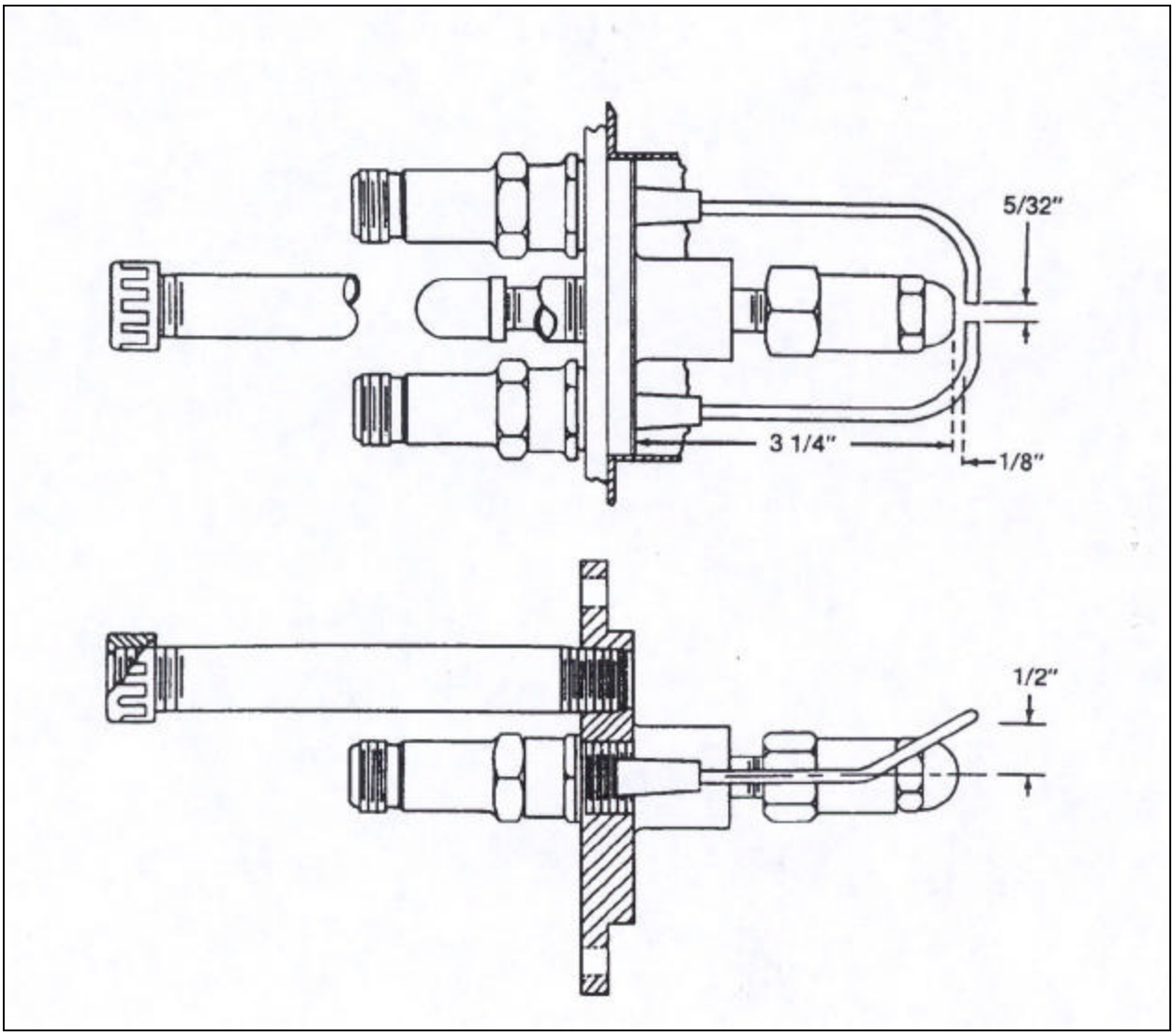


Figure 5-13

(6) Replacement

(a) Install nozzle and electrode assembly **(6, Figure 5-11)** in burner head assembly.

(b) Secure nozzle and electrode assembly to water heater, using four lock washers **(8, Figure 5-10)** and hex nuts **(9)**.

(c) Connect burner fuel line, both ignition cables, and scanner to burner head elbow **(Figure 5-10)**

5. **DIAGNOSE AND REPAIR DRAIN PUMP:**

a. Diagnose Drain Pump if water is leaking from diaphragm.

b. Replace diaphragm.

(1) Disassembly

(a) Remove two screws, two lock washers, and two sealing washers from the pump shaft housing assembly.

(b) Remove four screws, four lock washers, and four hex nuts from the pump frame.

(2) Replacement: Replace all defective items with serviceable items.

(3) Assembly

(a) Replace the two screws, two lock washers, and two sealing washer to the pump shaft housing assembly.

(b) Replace four screws, four lock washers, and four hex nuts to the pump frame.

REFERENCE

TM 08444A-15/1
TM 10006A-14&P/1